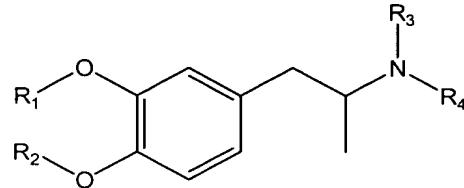


WHAT IS CLAIMED IS:

1. A compound of the formula:



5

Formula I

wherein: R^1 is H, lower alkyl, a protecting group, or is taken together with R^2 to form a ring,

10 R^2 is H, lower alkyl, a protecting group, $-(CH_2)_nC(O)R^6$ or $-(CH_2)_nR^6$ or is taken together with R^1 to form a ring,

R^3 and R^4 are independently H or lower alkyl or a protecting group, or, when R^1 is taken together with R^2 to form a ring, at least one of R^3 or R^4 is $-(CH_2)_nC(O)R^5$ or $-(CH_2)_nR^5$, or when R^1 is not taken together with R^2 to form a ring, at least one of R^1 and R^2 is not H or lower alkyl or a protecting group,

15 R^5 is H, -OH, -SH, -O-lower alkyl, halogen, NH₂, -succinimidyl, -maleimidyl, immunogenic carrier, or label,

R^6 is H, -OH, -SH, -O-lower alkyl, halogen, NH₂, -succinimidyl, -maleimidyl, immunogenic carrier, or label, and

n is an integer from 1 to 5,

20 with the proviso that, when R^1 is CH₃, R^2 is not $-CH_2C(O)R^6$, and

with the proviso that, when R^1 is taken together with R^2 to form a ring and when only one of R^3 and R^4 is H or lower alkyl and the other of R^3 and R^4 is $-(CH_2)_nC(O)R^5$, R^5 is a protein,

and including acid salts thereof.

25

2. A compound according to Claim 1 wherein said immunogenic carrier is a poly(amino acid).

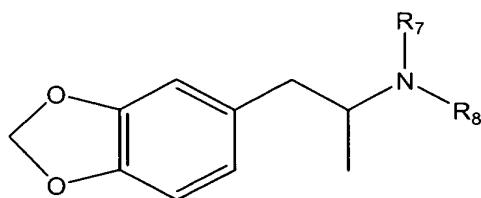
30 3. A compound according to Claim 2 wherein said poly(amino acid) is a protein.

4. Antibodies raised against the compound of Claim 3.

5. A compound according to Claim 1 wherein n is 1.

5 6. A compound according to Claim 1 wherein said label is an enzyme, a luminescer, or a radioisotope.

7. A compound of the formula:



10

Formula II

wherein: R⁷ is H, lower alkyl, a protecting group, -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵,
 R⁸ is H, lower alkyl, a protecting group -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵,
 R⁵ is H, -OH, -SH, -O-lower alkyl, halogen, NH₂, -NH-protein,
 15 -succinimidyl, -maleimidyl, immunogenic carrier, or label, and
 n is an integer from 1 to 5,
 with the proviso that at least one of R⁷ and R⁸ are not H or lower alkyl, and
 with the proviso that, when only one of R⁷ and R⁸ is H or lower alkyl and the other of R⁷
 and R⁸ is -(CH₂)_nC(O)R⁵, R⁵ is a protein,
 20 and including the acid salts thereof.

8. A compound according to Claim 7 wherein said protein is selected from

the group consisting of KLH, BSA, BGG, and ovalbumin.

25

9. Antibodies raised against the compound of Claim 8.

30

10. A compound according to Claim 7 wherein n is 1.

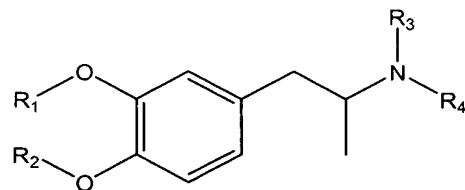
11. A compound according to Claim 6 wherein R⁷ is H or lower alkyl.

12. A compound according to Claim 7 wherein said label is an enzyme, a luminescer, or a radioisotope.

13. A method for determining a compound selected from the group 5 consisting of 3,4-methylenedioxymphetamine (MDA), 3,4-methylenedioxymethamphetamine (MDMA), 3,4-methylenedioxymethylamphetamine (MDEA) and 4-hydroxy-3-methoxy-methamphetamine (HMMA), said method comprising:

10 (a) providing in combination in a medium:

- (i) a sample suspected of containing said compound and
- (ii) an antibody raised against a compound of the formula:



wherein: R¹ is H, lower alkyl or is taken together with R² to form a ring,

15 R² is H, lower alkyl, -(CH₂)_nC(O)R⁶ or -(CH₂)_nR⁶, or is taken together with R¹ to form a ring,

R³ and R⁴ are independently H or lower alkyl, or, when R¹ is taken together with R² to form a ring, at least one of R³ or R⁴ is -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵, or when R¹ is not taken together with R² to form a ring, at least one of R¹ and R² is not H or lower alkyl,

20 R⁵ is an immunogenic carrier,

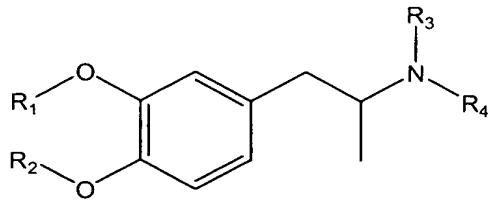
R⁶ is an immunogenic carrier, and

n is an integer from 1 to 5, and

25 (b) examining said medium for the presence a complex comprising said compound and said antibody, the presence thereof indicating the presence of said compound in said sample.

14. A method according to Claim 13 wherein said combination further comprises:

- (iii) a label conjugate of the formula:



wherein: R¹ is H, lower alkyl or is taken together with R² to form a ring,
 5 R² is H, lower alkyl, -(CH₂)_nC(O)R⁶ or -(CH₂)_nR⁶, or is taken together with R¹ to form a ring,

R³ and R⁴ are independently H or lower alkyl, or, when R¹ is taken together with R² to form a ring, at least one of R³ or R⁴ is -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵, or when R¹ is not taken together with R² to form a ring, at least one of R¹ and R² is not H or lower alkyl,

10 R⁵ is a label,

R⁶ is a label, and

n is an integer from 1 to 5, and

said examining comprises measuring signal from said label, the amount thereof being related to the presence of said compound in said sample.

15

15. A method according to Claim 14 wherein said method is a homogeneous method and said medium is examined for the amount of said signal.

16. A method according to Claim 14 wherein said method is a heterogeneous method and said complex, if present, is separated from said medium.

20 17. A method according to Claim 14 wherein said protein is selected from the group consisting of KLH, BSA, BGG and ovalbumin.

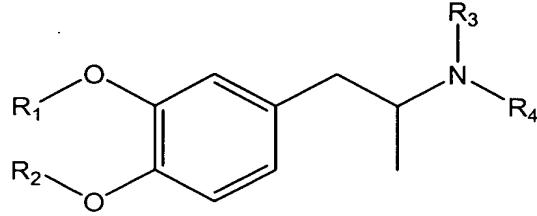
25

18. A method according to Claim 14 wherein n is 1.

19. A method according to Claim 15 wherein said label is an enzyme, a luminescer, or a radioisotope.

20. A kit for determining a compound selected from the group consisting of 3,4-methylenedioxymethamphetamine (MDA), 3,4-methylenedioxymethamphetamine (MDMA), 3,4-methylenedioxymethylamphetamine (MDEA) and 4-hydroxy-3-methoxymethamphetamine (HMMA), said kit comprising:

5 (a) an antibody raised against a compound of the formula:



wherein: R¹ is H, lower alkyl or is taken together with R² to form a ring,
 R² is H, lower alkyl, -(CH₂)_nC(O)R⁶ or -(CH₂)_nR⁶, or is taken together
 10 with R¹ to form a ring,

R³ and R⁴ are independently H or lower alkyl, or, when R¹ is taken together with R² to form a ring, at least one of R³ or R⁴ is -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵, or when R¹ is not taken together with R² to form a ring, at least one of R¹ and R² is not H or lower alkyl,

15 R⁵ is an immunogenic carrier,

R⁶ is an immunogenic carrier, and

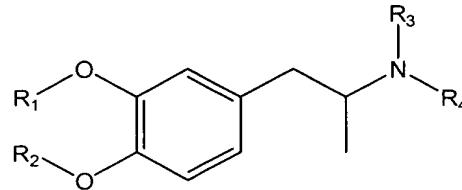
n is an integer from 1 to 5, and

(b) ancillary reagents for determining said compound.

20 21. A kit for determining a compound selected from the group consisting of 3,4-methylenedioxymethamphetamine (MDA), 3,4-methylenedioxymethamphetamine (MDMA), 3,4-methylenedioxymethylamphetamine (MDEA) and 4-hydroxy-3-methoxymethamphetamine (HMMA), said kit comprising:

(a) an antibody for said compound,

25 (b) a label conjugate of the formula:



wherein: R^1 is H, lower alkyl or is taken together with R^2 to form a ring,
 R^2 is H, lower alkyl, $-(CH_2)_nC(O)R^6$ or $-(CH_2)_nR^6$, or is taken together
with R^1 to form a ring,

5 R^3 and R^4 are independently H or lower alkyl, or, when R^1 is taken
together with R^2 to form a ring, at least one of R^3 or R^4 is $-(CH_2)_nC(O)R^5$ or
 $-(CH_2)_nR^5$, or when R^1 is not taken together with R^2 to form a ring, at least one
of R^1 and R^2 is not H or lower alkyl,

R^5 is a label,

10 R^6 is a label, and

n is an integer from 1 to 5,

(c) ancillary reagents for determining said compound.

22. A kit according to Claim 20 wherein said protein is selected from the
15 group consisting of KLH, BSA, BGG and ovalbumin.

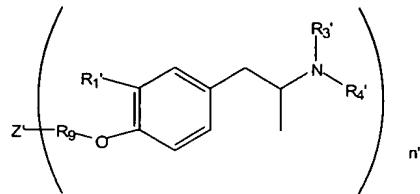
23. A kit according to Claim 20 wherein n is 1.

24. A kit according to Claim 21 wherein said label is an enzyme, a
20 luminescer, or a radioisotope.

25. A method for determining amphetamine and/or methamphetamine and/or
methylenedioxymethamphetamine in a sample suspected of containing
methylenedioxymethamphetamine and/or methylenedioxymethamphetamine and/or
25 methylenedioxymethamphetamine, said method comprising:

(a) providing in combination in a medium:

- (i) said sample,
- (ii) an antibody for methylenedioxymethamphetamine, and/or
- (iii) an antibody for methylenedioxymethamphetamine, and/or
- (iv) an antibody for methylenedioxymethamphetamine, and
- (v) a compound of the formula:



wherein:

R¹, is H, or methyl or ethyl

R³, is H,

R⁴, is H, or methyl or ethyl,

R⁹, is -(CH₂)_nC(O)R⁶, or -(CH₂)_nR⁶,

R⁶, is Z', which is an enzyme,

n' is an integer between 1 and the molecular weight of said enzyme divided by about 500; and

10 (b) examining said medium for the presence of a complex comprising said methylenedioxymphetamine and said antibody for methylenedioxymphetamine and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine, and/or a complex of said methylenedioxymethamphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine in said sample.

20 26. A method for determining methylenedioxymphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine in a sample suspected of containing methylenedioxymphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine, said method comprising:

(a) providing in combination in a medium:

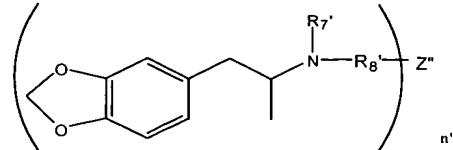
25 (i) said sample,

(ii) an antibody for methylenedioxymphetamine, and/or

(iii) an antibody for methylenedioxymethamphetamine, and/or

(iv) an antibody for methylenedioxymethamphetamine, and

(v) a compound of the formula:



wherein:

R⁷, is H, or methyl, or ethyl,

R⁸, is -(CH₂)_nC(O)R⁵, or -(CH₂)_nR⁵,

5 R⁵, is Z'', which is an enzyme,

n" is an integer between 1 and the molecular weight of said enzyme divided by about 500; and

(b) examining said medium for the presence of a complex comprising said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine and/or 10 a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine, the presence thereof indicating the presence of said methylenedioxymethamphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine in said 15 sample.

27. A method for determining methylenedioxymethamphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine in a sample suspected of containing methylenedioxymethamphetamine and/or 20 methylenedioxymethamphetamine and/or methylenedioxymethamphetamine, said method comprising:

(a) providing in combination in a medium:

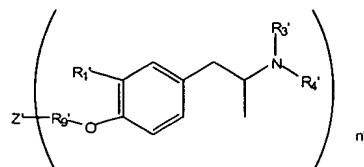
(i) said sample,

(ii) a conjugate of an enzyme and a methylenedioxymethamphetamine

25 analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog,

(iii) an antibody for methylenedioxymethamphetamine, said antibody

being raised against a compound of the formula:



wherein:

R¹, is H, or methyl or ethyl

R³, is H,

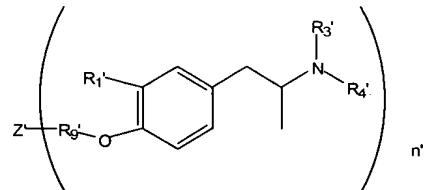
R⁴, is H,

5 R⁹, is -(CH₂)_nC(O)R⁶, or -(CH₂)_nR⁶,

R⁶, is Z', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

10 (iv) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



wherein:

R¹, is H, or methyl or ethyl

15 R³, is H,

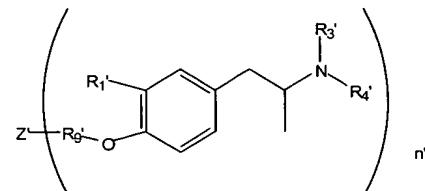
R⁴, is methyl,

R⁹, is -(CH₂)_nC(O)R⁶, or -(CH₂)_nR⁶,

R⁶, is Z', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

20 n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

(v) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



25 wherein:

R¹, is H, or methyl or ethyl

R³, is H,

R^4 , is ethyl,

R^9 , is $-(CH_2)_nC(O)R^6$, or $-(CH_2)_nR^6$,

R^6 , is Z' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

5 n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and

(b) examining said medium for the presence of a complex comprising said methylenedioxymphetamine and said antibody for methylenedioxymphetamine and/or a complex of said methylenedioxymphetamine and said antibody for methylenedioxymphetamine and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine, the presence thereof indicating the presence of said methylenedioxymphetamine and/or methylenedioxymethamphetamine and/or methylenedioxymethamphetamine in said sample.

15

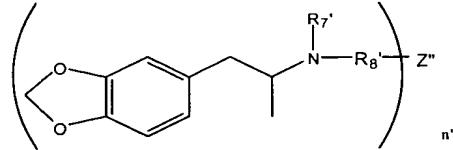
28. A method for determining methylenedioxymphetamine and/or methylenedioxymethamphetamine in a sample suspected of containing methylenedioxymphetamine and/or methylenedioxymethamphetamine, said method comprising:

20 (a) providing in combination in a medium:

(i) said sample,

(ii) a conjugate of an enzyme and an methylenedioxymphetamine analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog,

25 (iii) an antibody for methylenedioxymphetamine, said antibody being raised against a compound of the formula:



wherein:

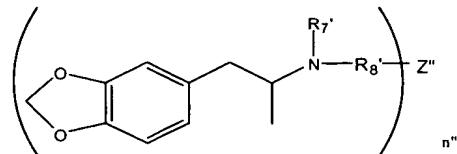
R^7 , is H,

30 R^8 , is $-(CH_2)_nC(O)R^5$, or $-(CH_2)_nR^5$,

R^5 is Z'' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

n'' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

5 (iv) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



wherein:

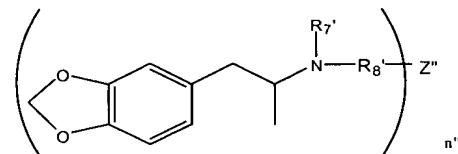
R^7 , is methyl,

10 R^8 , is $-(CH_2)_nC(O)R^5$, or $-(CH_2)_nR^5$,

R^5 , is Z'' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

n'' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

15 (v) an antibody for methylenedioxyethamphetamine, said antibody being raised against a compound of the formula:



wherein:

R^7 , is ethyl,

20 R^8 , is $-(CH_2)_nC(O)R^5$, or $-(CH_2)_nR^5$,

R^5 , is Z'' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

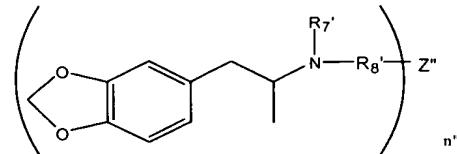
n'' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and

25 (b) examining said medium for the presence of a complex comprising said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxymethamphetamine and/or a complex of said methylenedioxyethamphetamine and said antibody for methylenedioxymethamphetamine, and/or a complex of said methylenedioxymethamphetamine and said antibody for methylenedioxyethamphetamine,

the presence thereof indicating the presence of said amphetamine and/or methamphetamine and/or methylenedioxymethamphetamine in said sample.

29. A kit comprising in packaged combination:

5 (i) an antibody for methylenedioxymethamphetamine, and/or
 (ii) an antibody for methylenedioxymethamphetamine, and/or
 (iii) an antibody for methylenedioxymethamphetamine, and
 (iv) a compound of the formula:



10 wherein:

$R^{7'}$ is H, or methyl, or ethyl,

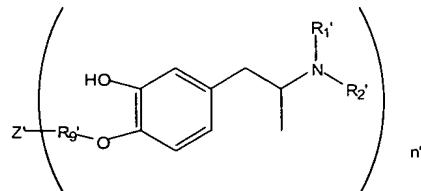
$R^{8'}$ is $-(CH_2)_nC(O)R^{5'}$ or $-(CH_2)_nR^{5'}$,

$R^{5'}$ is Z'' , which is an enzyme,

n'' is an integer between 1 and the molecular weight of said enzyme divided by
 15 about 500.

30. A kit comprising in packaged combination:

20 (i) an antibody for methylenedioxymethamphetamine,
 (ii) an antibody for methylenedioxymethamphetamine, and/or
 (iii) an antibody for methylenedioxymethamphetamine, and
 (iv) a compound of the formula:



wherein:

25 $R^{1'}$ is H,

$R^{2'}$ is H, or methyl or ethyl,

$R^{9'}$ is $-(CH_2)_nC(O)R^{5'}$ or $-(CH_2)_nR^{5'}$,

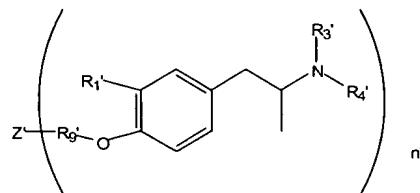
$R^{5'}$ is Z' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500.

31. A kit comprising in packaged combination:

5 (i) a conjugate of an enzyme and a methylenedioxymethamphetamine analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog, and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog, and

10 (ii) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



wherein:

R¹, is H, or methyl or ethyl

15 R³, is H,

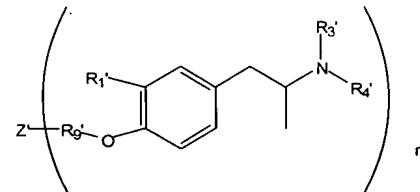
R⁴, is H,

R⁹, is -(CH₂)_nC(O)R⁶, or -(CH₂)_nR⁶,

R⁶, is Z', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

20 n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

(iii) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



25 wherein:

R¹, is H, or methyl or ethyl

R³, is H,

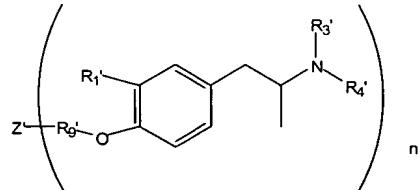
R⁴, is methyl,

R^9 , is $-(CH_2)_nC(O)R^6$, or $-(CH_2)_nR^6$,

R^6 , is Z' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

5 n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500, and/or

(iv) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



wherein:

10 R^1 , is H, or methyl or ethyl

R^3 , is H,

R^4 , is ethyl,

R^9 , is $-(CH_2)_nC(O)R^6$, or $-(CH_2)_nR^6$,

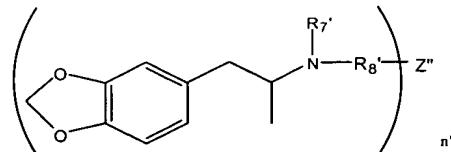
15 R^6 , is Z' , which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

n' is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500.

32. A kit comprising in packaged combination:

20 (i) a conjugate of an enzyme and an methylenedioxymethamphetamine analog and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog, and/or a conjugate of an enzyme and a methylenedioxymethamphetamine analog, and

25 (ii) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



wherein:

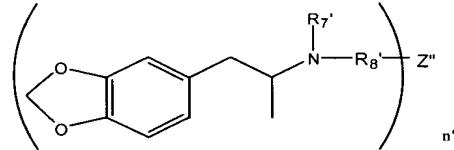
R⁷, is H,

R⁸, is -(CH₂)_nC(O)R⁵, or -(CH₂)_nR⁵,

R⁵, is Z'', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

5 n" is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500; and/or

(iii) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



10 wherein:

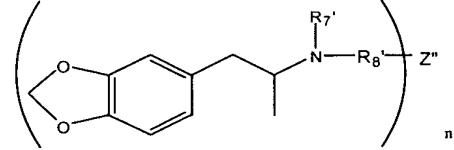
R⁷, is methyl,

R⁸, is -(CH₂)_nC(O)R⁵ or -(CH₂)_nR⁵,

R⁵, is Z'', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

15 n" is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500, and/or

(iv) an antibody for methylenedioxymethamphetamine, said antibody being raised against a compound of the formula:



20 wherein:

R⁷, is ethyl,

R⁸, is -(CH₂)_nC(O)R⁵, or -(CH₂)_nR⁵,

R⁵, is Z'', which is an immunogenic protein or a non-poly(amino acid) immunogenic carrier,

25 n" is an integer between 1 and the molecular weight of said immunogenic protein or said immunogenic carrier divided by about 500.

* * * * *